# RESILIENCE IN THE COVID-19 PANDEMIC: A STUDY OF BOARD DIVERSITY THROUGH A CRISIS MANAGEMENT PLAN

Pingying Zhang, University of North Florida

Nada Kakabadse, University of Reading

Cheryl Van Deusen, University of North Florida

Paul Fadil, University of North Florida

## ABSTRACT

During the initial phase of the COVID-19 pandemic, businesses faced an economic shock never seen before. This paper addresses what firms could do to enhance resilience in a crisis of this magnitude. We argue that diversity in boards can enable firms to bounce back from a crisis. Moreover, a board's involvement in a crisis management plan is critical in strengthening firm resilience. We have applied an information processing perspective to examine two diversity dimensions: board cognitive diversity and board gender diversity. Survey data of 271 responses collected between April and June 2020 from the US are used in the structural equation modeling analysis. The results show that, on the one hand, board cognitive diversity is a desirable feature, significantly improving a board's contribution to a crisis management plan, which strengthens a firm's resilience. On the other hand, board gender diversity poses a negative impact on resilience. The paper concludes with discussions and future research proposals.

***Keywords***: COVID-19; Resilience; Boards of Directors; Cognitive Diversity; Gender Diversity; Crisis Management Plan

## INTRODUCTION

As the decision-making apex, boards of directors exert a critical impact on firm performance, especially during a turbulent period such as a crisis (Fernandes, Farinha, Artins, & Mateus, 2017; Luciano, Nahrgang, & Shropshire, 2020; McNulty, Florackis, & Ormrod, 2013). The COVID-19 pandemic provides just such a situation to enable us to examine board influence in devastating times for many businesses (Foss, 2020). The speed and indiscriminate nature of the pandemic has brought an economic shock that we have never seen before (The Economist, 2020d). Already in March and April of 2020, businesses had started to face disrupted supply chains and a severe decline in revenues, with only enough cash and inventories to survive three to six months, and many undertook a high risk in furloughing their employees (The Economist, 2020b, 2020c). The economy was not yet out of the woods when the total daily cases in the US surpassed 100,000 by early November of 2020 (CDC, 2020).

In the initial phase of the pandemic, amid the chaos, researchers observed a lack of diverse perspectives in dealing with the COVID-19 outbreak. This may have hindered discussions of alternatives that top decision-makers ignored until long into the pandemic (Foss, 2020). The lack of information diversity falls short of meeting the information-processing demand for novel and complex decision-making in turbulent times (Luciano et al., 2020). However, the study of board

diversity in crises is limited (Duchek, Raetze, & Scheuch, 2020). It may be the case that a lack of diversity simplifies information that could help firms adapt to a crisis swiftly. Still, there is support for the argument that a richer information variety and more deliberate information gathering can create sustainable advantages that firms need to handle the COVID-19 pandemic (Foss, 2020).

An interdisciplinary approach could help deliver meaningful research on firm actions in a pandemic (Budhwar & Cumming, 2020). This study aims to combine board diversity and the crisis management plan to shed light on how board diversity influences firm resilience during the early phase of the COVID-19 outbreak in the US. A crisis management plan underscores the extent to which a firm is prepared to handle a crisis. It entails a process that gathers and stores the information needed to guide a firm to reduce the external shock and even enable the firm to explore opportunities (Bundy, Pfarrer, Short, & Coombs, 2017; Egelhoff & Sen, 1992). Evidence suggests that board involvement in a crisis management plan mitigates a crisis's negative financial impact (Ferrero-Ferrero, Fernandez-Izquierdo, & Munoz-Torres, 2012) as well as an adverse strategic impact (Preble, 1997), strengthening business resilience to bounce back. We further argue that board involvement in developing a crisis management plan reflects the effort of performing shared tasks involving boards and top management teams, coordinating the understanding of strategic change versus persistence ex ante (Luciano et al., 2020).

The paper has applied the information processing perspective (Galbraith, 1974; Olson, Parayitam, & Bao, 2007) to address the issue of information diversity in the pandemic (Foss, 2020). First, this perspective claims that diverse information is a prerequisite for meaningful information processing (Galbraith, 1974; Weick, 1988), and the presence of it is critical for problem-solving (Simons, 1978), especially during a crisis (Galbraith, 1974). According to the information processing theory (Galbraith, 1974; Olson et al., 2007), a broad pool of diverse information presents many benefits. It improves the quality of group decision-making (Simons, Pelled, & Smith, 1999; Williams & O'Reilly, 1998) and reduces information risk embedded in the uncertainty of the external environment (Olson et al., 2007). It can even facilitate a fast decision-making process (Eisenhardt, 1989; Kanadli, Bankewitz, & Zhang, 2018). Second, information processing emphasizes the use of diverse information, where sharing and processing the available and unique information is crucial for problem-solving (Simons, 1978; Van Knippenberg, De Dreu, & Homan, 2004). The claim supports exploring a potential mediator that brings the idea of using diverse information to light.

The contribution of the paper is three-fold. First, the paper contributes to the call for examining the boards of directors in a crisis (Duchek et al., 2020; Luciano et al., 2020). We provide evidence supporting the importance of building board diversity as an effective approach to crisis management. Second, continuing the discussion of identifying and examining mediators when studying board diversity (McNulty et al., 2013; Triana, Miller, & Trzebiatowski, 2014; Van Knippenberg et al., 2004), we demonstrate the power of a context-relevant mediator—board involvement in a crisis management plan—in shaping resilience during the pandemic. Third, the paper contributes to studies of diversity dimensions (Milliken & Martins, 1996; Nkomo, Bell, Roberts, Joshi, & Thatcher, 2019; Williams & O'Reilly, 1998) by investigating board cognitive and board gender diversity simultaneously. Albeit there are concerns regarding the dimensions of diversity (Van Knippenberg et al., 2004), the separation improves the understanding of how board diversity influences resilience in the COVID-19 crisis.

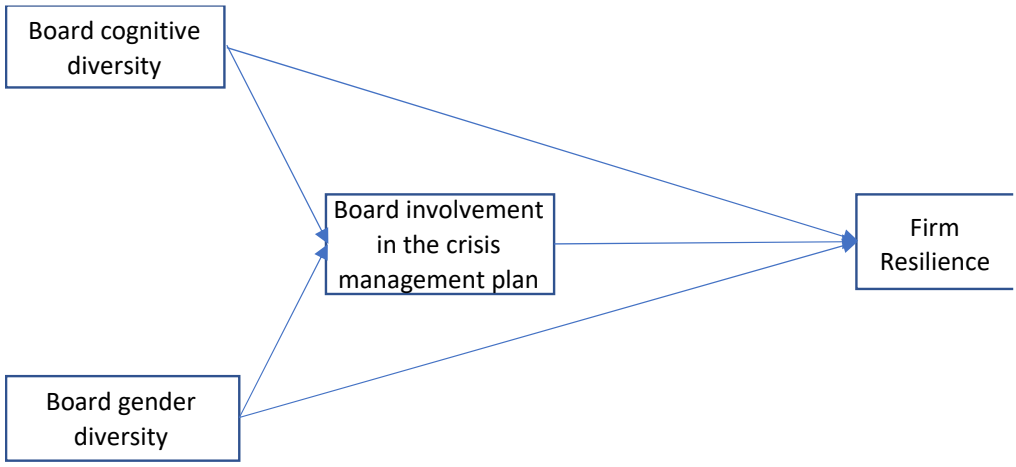
## BOARD DIVERSITY AND RESILIENCE

The term "diversity" comes in different shapes and sizes. In principle, diversity describes differences perceived in a group, which can mean an infinite number of dimensions of characteristics (Van Knippenberg et al., 2004). It is interesting to point out that earlier inconsistent findings of group diversity have pushed the research effort into identifying diversity dimensions, such as demographic diversity and cognitive diversity, to shed light on distinct diversity impacts in an empirical setting (Dahlin, Weingart, & Hinds, 2005; Jackson, May, & Whitney, 1995; Miller, Burke, & Click, 1998; Milliken & Martins, 1996; Pelled, 1996; Simons et al., 1999; Van Knippenberg et al., 2004; Williams & O'Reilly, 1998). We continue the effort in examining the impact of two dimensions of diversity on resilience in a crisis, namely cognitive diversity and gender diversity.

Cognitive diversity captures the information/decision-making advantages due to differences in, for example, educational backgrounds, experiences, skills, and values (Jackson et al., 1995). We use board cognitive diversity to address differences in individual directors' assumptions, thinking modes, perspectives, and causal beliefs. Board cognitive diversity can bring out multiple aspects of a key issue that the firm needs to be aware of when responding to adversity. Gender diversity captures a degree of balance between female and male boards of directors of a firm. The board gender diversity has shown increasing importance in board research (Kakabadse, Figueira, Nicolopoulou, Yang, Kakabadse & Ozbilgin, 2015; Triana et al., 2014), where a gender diverse board seems to add more value to a firm than a male-dominated board.

Board diversity is not only beneficial for normal business operations; it could also influence resilience during the COVID-19 pandemic. During the early phase of the pandemic, unessential activities stopped temporarily, cities were in lockdown for weeks, and the difficulty in handling this sudden change was tremendous (The Economist, 2020b, 2020c, 2020d). Facing devastating consequences, organizations must respond to in order to survive (Weick, 1988). We present the research framework in Figure 1, arguing that board diversity can be a desirable feature for firms to approach crisis management and strengthen their resilience in a crisis.

Figure 1. Research Model



## Cognitive Diversity

The information processing theory postulates that the acquisition of diverse and unique information precedes and influences effective decision-making (Olson et al., 2007). Cognitive diversity is conducive to the process of collective information acquisition (Galbraith, 1974; Olson et al., 2007). In this regard, cognitive diversity focuses on an individual's task-related differences, an individual as an information processor, assembling, sorting, and filtering unique information that is potentially critical for solving problems (Gibson, 2001). The more diverse a group is, the broader the range for collective information accumulation, and the better the group outcome (Smith, Smith, Olian, Sims, Bannon & Scully, 1994). We elaborate on the advantages of cognitive diversity in the following.

First, the extent of collective information accumulation helps to deal with the many uncertainties entrenched in a crisis, and is a necessary organization contingency that we need to pay attention to (Thompson, 1967). When uncertainty increases, the amount of diverse information needed to achieve effective decision-making also increases (Egelhoff & Sen, 1992; Galbraith, 1974). Scholars examining the top management team have demonstrated that functional diversity becomes more useful when the environment becomes more uncertain (Cannella, Park, & Lee, 2008).

Second, the extent of diverse information is instrumental for the cognitive elaboration of decision-makers in a crisis (Stubbart, 1987), stimulating group creativity in identifying an innovative solution. Studies have validated the claim that cognitive diversity of the top decision-makers strengthens innovative problem-solving in the team (Pelled, Eisenhardt, & Xin, 1999; Torchia, Calabrò, & Morner, 2015) and contributes to the generation of strategic alternatives (Erhardt, Werbel, & Schrader, 2003). Albeit innovative solutions are good to have in general, they are even more valuable in a volatile environment, where standard approaches and solutions cease to be effective (Bantel & Jackson, 1989; Wiersema & Bantel, 1992). Moreover, researchers have found that cognitive diversity enhances organizational adaptations to a changing environment (Wiersema & Bantel, 1992) and improve administrative innovations in an organization (Bantel & Jackson, 1989). It is reasonable to suggest board cognitive diversity can enable the members to battle non-routine challenges in the pandemic.

Third, cognitive diversity engages multiple information filters to reduce information risks in a high-stakes environment, such as a crisis (Egelhoff & Sen, 1992; Olson et al., 2007). In a diverse group, individual decision-makers apply various filters to plow through the information presented to them and select those that are the most task-relevant—the more filters applied in sorting and selecting critical information, the better the quality of the decision-making. The use of filters may seem trivial when the decision-making is simple; however, it is increasingly important when a simple issue turns into a high-stakes matter. For example, it is normal for revenue to fluctuate; yet, a sudden drop in revenue due to a pandemic can quickly propel firms to shore up short-term liquidity. There are different approaches, such as cutting R&D investment, closing stores, or furloughing employees. Some are perhaps better than others. Directors could engage their multiple filters to reduce the information risk in selecting an appropriate one to recommend to management.

In short, the board's cognitive diversity fits the need to solve complex crises by using multiple filters.

Will the amount of unique information slow down the decision-making speed? One view suggests that diversity eventually leads to a high level of disagreement among members, who will take a longer time to settle their differences (Jehn, Northcraft, & Neale, 1999). Also, the amount of various views and opinions might increase the comprehensiveness of discussions, slowing down the integration of diverse information (Dahlin et al., 2005). Another view, however, indicates otherwise, which shows that top-level decision-makers understand the importance of time and can speed up the decision-making process in a diverse team (Kanadli et al., 2018). The second view also claims that fast decision-makers usually demand a greater amount of information than slow decision-makers (Eisenhardt, 1989). We align our thought with the latter view. It is reasonable to assume that directors are aware of the importance of time, and their quality of work depends on the amount of diverse information and their decision-making speed. Directors could also be fast decision-makers during a crisis when the organization must respond without delay to survive (Weick, 1988).

Overall, board cognitive diversity creates task-related information advantages, reduces uncertainty, limits information risk, and increases the creativity of decisions in a crisis. Firm resilience becomes stronger.

*Hypothesis 1.1: Board cognitive diversity is positively associated with resilience during the COVID-19 pandemic.*

**Gender Diversity**

Gender diversity is an often researched diversity dimension (Van Knippenberg & Schippers, 2006; Williams & O'Reilly, 1998). Board gender diversity measures the degree of gender balance in a boardroom. Despite the benefit of gender diversity in a board, male directors dominate most corporate boards (Eagly, 2016; Kakabadse et al., 2015; Triana et al., 2014). Improvements are being made over the years by implementing a gender quota system to promote female participation, such as in Norway (Huse, 2018). Still, female directors' involvement is limited. A recent article points out that female directors only hold about 17% of board directorships in global companies in the MSCI ASWI Index and about 21% of board seats in the S&P 500 (Cheng & Groysberg, 2020). In the U.S., female directors have increased by a net amount of 2,700, while male directors have declined by 1,900 from 2015 to 2021 (Wakefield, et. al, 2021). U.S. firms have advanced greatly toward a gender-balanced board. Using information processing theory (Galbraith, 1974), a gender diverse board is more likely to gain information advantages than a less diverse board in a crisis.

From the information processing view, female and male directors can bring a multiplicity of information sources. It is due to the fact that female directors significantly differ from their male counterparts in professional background, education, and pattern of board affiliations (Hillman, Cannella, & Harris, 2002). Such differences in disciplinary and educational backgrounds reflect information variety (Harrison & Klein, 2007), signifying female directors are able to generate a different set of expertise, experiences, and network ties, complementing their male counterparts.

It is interesting to notice that female directors influence not only the type of information and issues to be discussed but also the manner in which diverse views are shared among members (Kakabadse et al., 2015). That is, women tend to display a collaborative working style, and they demonstrate strong empathy and sensitivity (Terjesen & Val Sign, 2009). The gender traits suggest female directors are willing to listen to dissimilar opinions and can be effective communicators of diverse views. Thus, a gender diverse board can better circulate unique information: a crucial aspect of managing information processing during a crisis (Osler, 2016). Other researchers even claim that female directors' unique knowledge could serve as a better control mechanism to strengthen a firm's financial performance (Campbell & Minguez-Vera, 2008; Gul, Srinidhi, & Ng, 2011; Poletti-Hughes & Briano-Turrent, 2019).

There is a risk. Researchers using the social categorization perspective point out that gender diversity creates group conflicts and biases because of the incompatible differences between males and females (Tajfe, 1981; Van Knippenberg et al., 2004). It also creates a perception of inferior social status (Kakabadse et al., 2015; Main & Gregory-Smith, 2017; Nielsen & Huse, 2010), influencing female directors' career advancement. Meantime, male directors may feel the need to protect their authority, which reduces group cohesion and group performance. The impact of disparity could overpower that of information variety, and the net effect becomes negative.

Nevertheless, we argue that the urgency of dealing with a crisis may help directors keep things in perspective. The significance of any crisis with a considerable impact may shape directors' attention towards value-focused activities. Hence, the effect of information variety becomes stronger than that of social categorization.

*Hypothesis 1.2: Board gender diversity is positively associated with resilience during the COVID-19 pandemic.*

Studies of gender diversity are still inconclusive (Eagly, 2016), and research on cognitive diversity also yields a similar result (Miller et al., 1998). The direct impact of gender and cognitive diversity on firm resilience becomes questionable. To address this issue, we could explore potential mediators through which diversity exerts its effect (McNulty, 2013; Meissner & Wulf, 2017; Van Knippenberg et al., 2004). For example, directors' involvement in an open discussion is an effective way to utilize diverse information of a board, through which board cognitive diversity improves board strategic task performance (Zhang, 2010). Indeed, identifying a context-specific mediator could increase our understanding of the board's actions in a crisis (McNulty, 2013).

## BOARD INVOLVEMENT IN A CRISIS MANAGEMENT PLAN

A crisis is considered to be an event that is highly salient, unexpected, and potentially disruptive for business operations (Bundy et al., 2017). Crisis management "*broadly captures organizational leaders' actions and communication that attempt to reduce the likelihood of a crisis, work to minimize harm from a crisis, and endeavor to reestablish order following a crisis*" (Bundy et al., 2017, p.1663).

There is a strong call for boards of directors to fully participate in developing a firm's crisis management plan (Cohn, 2020; Deloitte, 2019; Osler, 2016), in addition to their typical board roles. They are, for example, monitoring the management on behalf of shareholders, providing valuable advice, and networking (Johnson, Daily, & Ellstrand, 1996; Zahra & Pearce, 1989). Albeit it is the top executives' responsibility to develop the plan articulating pre-crisis defensive and preventive initiations, the board is responsible for approving the plan (Preble, 1997). In the following, we apply the information processing perspective to present the benefits of board involvement in a crisis management plan.

According to information processing, crisis management is about developing a system of gathering, storing, sharing, and interpreting information for decision-making and communication (Egelhoff & Sen, 1992). A noticeable feature of crisis management is the uncertainty of the event, which suggests that the amount of uncertainty elicits a corresponding amount of information that has to be processed during the execution of strategies and policies (Galbraith, 1974). When the uncertainty is low, the group understands a task well before performing it, and the group can plan much of the activities (Galbraith, 1974). When the information uncertainty increases, the plan becomes difficult. Consequently, a crisis management plan should prepare firms to engage in strategies and policies to increase flexibility and the ability to reduce the impact of information uncertainty on planning (Galbraith, 1974), and help firms manage the information uncertainty before, during, and after a crisis (Bundy et al., 2017). Board involvement in a crisis management plan could help build the amount of information required to navigate the uncertainty.

Boards of directors can bring the benefit of diverse backgrounds and expertise, and enrich the information-gathering stage of crisis management. The information variations could help create collective managerial mindfulness of the changing environment (Weick, Sutfliffe, & Obstfeld, 1999), contributing to a highly reliable organization capable of managing unexpected events (Bundy et al., 2017). Also, crisis management recognizes the negative impact of cognitive limitations in managing a crisis (Kahn, Barton, & Fellows, 2013), implying the potential benefit that board diversity could present to the crisis management plan.

Board involvement in a crisis management plan underscores the need to utilize information in a volatile environment, instrumental for building strategic leadership by the board in a crisis (Luciano et al., 2020). Strategic leadership suggests that, besides working independently of the management team, directors should also work *with* the management team to process information (Luciano et al., 2020). As a result, the coordination of understanding ex ante and the coordination of actions responding to a crisis strengthens. The importance of collective information processing due to the board's engagement with the management team is also noticed in other studies. For instance, it can reduce the barrier to information (Boivie, Bednar, Aguilera, & Andrus, 2016) and avoid sub-optimal strategic decisions (Morais, Kakabadse, & Kakabadse, 2018).

The above benefits of board involvement in crisis management echo the observation of board participation. For instance, boards of directors can challenge a crisis management proposal by scrutinizing the plan, ensuring the crisis management plan is executed correctly, intervening when the management team fails to manage the crisis, and learning from each crisis management (Cohn, 2020; Deloitte, 2019; Loop, 2017; Osler, 2016). We summarize the board involvement in four areas: 1) the creation of the crisis management capabilities, 2) the development of crisis

management responsibilities and roles, 3) the identification of a crisis spokesperson, and 4) the development of IT preparedness to be deployed during a crisis.

First, the boards of directors could contribute to the crisis management plan by ensuring that the crisis management capabilities are in place (Deloitte, 2019). Crisis management capabilities reflect dynamic management capabilities, which construct, integrate, and reconfigure the organization's resources and competences (Adner & Helfat, 2003). It resonates with the idea of organizational preparedness for a crisis, drawing from an internal perspective of crisis management (Bundy et al., 2017). Practitioners believe that whether or not a firm can successfully walk out of a crisis with minimal damage is directly associated with its crisis management capabilities (Loop, 2017; Osler, 2016).

Building crisis management capabilities could stimulate proactive interventions. Even though most crises are unforeseeable, there are often clues signaling pending crises, which are identifiable. Firms could manage the uncertainty to a certain degree by addressing potential problems before developing into an uncontrollable disaster. Specifically, the boards of directors' alertness to the early warning signals from the external environment could strengthen crisis management capabilities in developing defensive approaches to managing a crisis (Loop, 2017; Osler, 2016). Case in point, before most US businesses came to a halt by March 2020, there were already warning signs in other parts of the world. Several European countries, such as Italy and Spain, stopped normal economic activities to slow down the spread of COVID-19 (The Economist, 2020a). The fall of revenue generation became unavoidable for many businesses. The warning signs could also be seen from within organizations (Gephart, Van Maanen, & Oberlechner, 2009), underlying the destructive managerial behavior of complacency and over-optimism. Board's involvement in developing the crisis management capabilities helps the management team initiate preventive approaches limiting the behavioral mismanagement of a crisis (Bundy et al., 2017).

All in all, crisis management capabilities can yield a more comprehensive approach to the overall productive strategic management of a crisis (Preble, 1997). Firm resilience is likely to strengthen.

Second, identifying a crisis handler, specifying the responsibilities of leading the firm in a crisis has received much research focus in crisis management (Bundy et al., 2017), resonating with the practitioner's view of crisis management at the board level (Osler, 2016). The board adds value by establishing clear expectations of the responsibilities and roles during a crisis period. The board's involvement may create opportunities for meaningful discussions between the directors and the management team of what to do, contributing to identifying key members from the management team, who, besides their regular duties, are trained and prepared to take additional responsibilities and roles during a crisis (Loop, 2017; Osler, 2016).

Developing crisis-related responsibilities satisfies the information-processing demand. Managing information flow in a timely and effective fashion is a critical element of a crisis management plan (Bharosa, Lee, & Janssen, 2010; Ozanne, Ballantine, & Mitchell, 2020). The specification of the crisis-related responsibilities and roles increases information-processing capacity, which reduces the information-processing overload on a daily management structure when the uncertainty heightens (Galbraith, 1974). Moreover, when the crisis-related responsibilities and roles are integrated with the day-to-day operational design, the execution of crisis management becomes

more efficient (Preble, 1997). In short, the board can affect the internal preparedness by clarifying the crisis management related responsibilities and roles. The firm's survival is enhanced.

Third, firms bear the responsibility to inform the vast stakeholders of the crisis impact and firm responses (Christianson, Farkas, Sutcliffe, & Weick, 2009). Identifying a chief spokesperson could be one efficient approach. The public, consumers, and employees are keen on receiving prompt updates during a crisis; a crisis, thus, contains a seed of opportunity for leaders and managers to display leadership skills through communication (Williams, Gruber, Sutcliffe, Shepherd, & Zhao, 2017).

The practicality of identifying a chief spokesperson has received support from business communities, where boards of directors play a role (Deloitte, 2019; Loop, 2017; Osler, 2016). It is tough to provide accurate and timely information to satisfy the demand, especially when opinions, false stories, and facts are entangled (Loop, 2017). A selection of the right spokesperson before a crisis may achieve effective 'meaning' making, facilitating the progression of recovery (Williams et al., 2017), as well as safeguarding a firm's reputation (Osler, 2016).

Fourth, information technology (IT) preparedness is another critical aspect of the crisis management plan (Egelhoff & Sen, 1992), and doing so strengthens the internal preparedness of an organization for a crisis (Bundy et al., 2017). A recent study shows that firms with IT preparedness before the COVID-19 pandemic fare better than those without (Shankar, 2020). During the epidemic, employees worked remotely, and traditional face-to-face business transactions also went online (The Economist, 2020a). Organizational IT preparedness suggests firms are prepared to transition to the online space with reduced disruption. Boards of directors can add value by ensuring that goal.

To sum up, the boards of directors are a vital force for a crisis management plan. They can help develop the crisis management capabilities, clarify crisis management responsibilities and roles, identify the key spokesperson, and ensure IT preparedness.

*Hypothesis 2.1: The degree of the board's involvement in the crisis management plan is positively associated with firm resilience during the COVID-19 pandemic.*

A crisis management plan resonates with the concept of motivated information processing, describing a specific motivational influence on group information processing and decision-making (De Dreu, Nijistad, & Van Knippenberg, 2008). Researchers have claimed that information processing includes various activities centered on epistemic motivation, capturing a group's willingness to expend effort to understand the creative generation, dissemination, and integration of information (De Dreu et al., 2008). Board diversity may build a stronger epistemic motivation that engages the board to find solutions pertaining to a crisis intelligently. Thus, it is reasonable to suggest a positive link between board diversity and board involvement in the crisis management plan.

The positive relationship gets additional support from what may happen if the diversity is absent during a crisis. Researchers have demonstrated that boards of directors often fail to understand a crisis because of their narrow vision (Merendino & Sarens, 2020). Board diversity could help

correct the limited vision by developing an inclusive view of a crisis management plan, increasing awareness of various stakeholder demands during a crisis. The success of managing COVID-19 in South Korea confirms comprehensive information processing in a crisis needs multiple sources of information (Lee, Yeo, & Na, 2020). Hence, board diversity addresses the need for adequate information provision in a crisis management plan (Ozanne et al., 2020).

*Hypothesis 2.2: Board cognitive diversity positively and indirectly improves resilience through board involvement in the crisis management plan during the COVID-19 pandemic.*

*Hypothesis 2.3: Board gender diversity positively and indirectly improves resilience through board involvement in the crisis management plan during the COVID-19 pandemic.*

## METHOD

We applied survey data in this study. The data was collected between April 23 and June 5 of 2020 in the US. It was a period when many firms had started to suffer the impact of the extreme economic volatility induced by the COVID-19 pandemic (The Economist, 2020b, 2020c). Data collection involved two stages. First, we developed the survey items to capture the constructs, and then we collaborated with Qualtrics to launch the data collection in the US.

The survey questions contain firm information, board directors' characteristics, and board responses to the COVID-19 pandemic. We have undertaken three steps to ensure the survey's quality: examining survey questions in reports of board crisis responses (e.g., Deloitte, 2019; Loop, 2017; Osler, 2016), conducting the literature review of board behavior (e.g., McNulty et al., 2013; Sellevoll, Huse, & Hanse, 2007), and discussing survey item development with researchers and practitioners in the field of the boards of directors. To gauge the quality, we launched two pilot tests in April of 2020 among board researchers and board directors, and integrated the feedback into the final design.

Qualtrics is an experience management company owned by SAP. It provides the survey tool and a rich network of professionals willing to assist researchers in collecting data. Using Qualtrics to collect data comes with a fee proportionate to the data collection difficulty and the amount of data collected. There is some evidence that data collection through Qualtrics satisfies a rigorous research requirement (Holt & Loraas, 2019). However, caution is needed in the survey design and data screening (Owens & Hawkoins, 2019). Following the suggestions of using Qualtrics effectively (Holt & Loraas, 2019; Owens & Hawkoins, 2019), we set up several criteria for the data collection process. First, participants are companies with boards of at least four members. Respondents can be a company's CEO, its board chairperson, or board member. Some 538 respondents participated in the survey from 41 US states. The exclusion of responses with a board size smaller than four reflects a situation where small firms are unlikely to develop a crisis management plan (Berbane, 2010), which is a crucial element in this study. Second, the average length of completion time is about nine minutes, and we removed responses with a completion time of less than five minutes. Third, we removed responses that showed any typical data patterns, such as an exact ascending or descending order in the answers. Fourth, we removed responses

where the percentage of female directors was 100%, and where the board has more than eight directors, as such cases are relatively rare (Cheng & Groysberg, 2020). Fifth, any incomplete response regarding directors' competence is removed. Sixth, responses with any inconsistencies in questions related to the total board members and the total women directors are also removed. After screening, we have 271 cases.

Of the final data, 23% of the respondents are CEOs, 12% are board chairpersons, 15% serve dual positions of both a CEO and a board chairperson, 47% are inside board directors, and 3% are outside board directors. The mix of different respondents may reduce respondent bias in a survey design (Meier & O'Toole Jr., 2013). Regarding the board size, 80% of the final data suggests a size between four and ten directors. Specifically, four-member boards count for 11%, five and six-member boards each count for 15% respectively, seven-member boards count for 10%, eight-member boards for 11%, nine-member boards for 6%, and ten-member boards for 11%. Last, 4.4% of cases suggest a board size larger than 15 members.

Regarding the early COVID-19 impact on firm revenue, most responses have indicated a negative effect, where 66% have seen an evident decline in firm financials, and half of which claimed a significant drop. Some 12.5% of respondents have not yet observed any financial impact. The rest saw an increase in financials. We also surveyed the industry of the firms: 18% of them are from the IT segment, 17% from finance, 11% each from manufacturing and retail market respectively, 9% from healthcare, 6% each from the hospitality and the construction sector respectively, and 5% from transportation and logistics. The remainder make up less than 2%. We present additional descriptive statistics in Table 1.

Table 1. Descriptive Data and Correlation

| N= 271 | Min | Max | Mean | Std. Dev | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|---|---|
| Employee | 2 | 6 | 4.32 | 1.490 | 1 | | | | | |
| Revenue 2019 | 1 | 6 | 3.83 | 1.698 | 0.581*** | 1 | | | | |
| Tenure | 1 | 5 | 2.94 | 0.867 | 0.009 | 0.123 | 1 | | | |
| Total board directors | 4 | >15 | 10 | 3.253 | 0.208*** | 0.227*** | 0.030 | 1 | | |
| Board gender diversity (Blau Index) | 0 | 0.50 | 0.45 | 0.06 | 0.030 | -0.041 | -0.155* | -0.006 | 1 | |
| Life cycle stage | 1 | 4 | 2.59 | 0.595 | 0.078 | 0.070 | 0.124* | 0.060 | 0.006 | 1 |

Notes

***. Correlation is significant at the 0.001 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Employee numbers

1: Below 100, 2: 101–300, 3: 301–500, 4: 501–700, 5: 701–900, 6: More than 900

Firm's revenue for 2019

1: Below USD 10 million, 2: USD 11–50 million, 3: USD 51–100 million, 4: USD 101–300 million, 5: USD 301–600 million, 6: More than USD 600 million

Life cycle stage

1: Start-up stage, 2: Growth stage, 3: Mature stage, 4: Decline stage

## Constructs and Variables

We present survey questions for the constructs in Appendix 1. They include board cognitive diversity, board involvement in the crisis management plan, resilience, and board expertise that serves as a control variable in the model.

Board cognitive diversity measures the degree of variation in directors' backgrounds related to board task performance and decision-making quality (Simons et al., 1999; Williams & O'Reilly, 1998). Specifically, we have focused on differences regarding directors' educational background, industry expertise, and functional knowledge. These differences can suggest a healthy informational variety and serve as an indicator of a group's cognitive strength (Harrison & Klein, 2007). We include directors' visions for the firm and personal values, as they also lead to informational variety in a group (Jackson et al., 1995).

The idea of resilience represents a firm's ability to overcome adversity, and its specific measurement can, however, vary depending on the research context (Duchek et al., 2020; Williams et al., 2017). We chose one of the typical approaches to measure resilience, measuring how well the firm has managed to respond to and bounce back from the crisis (Linnenluecke, 2017). In that respect, resilience should address a firm's strength to recover following an initial economic shock (Williams et al., 2017), which includes a firm's ability to adapt to a sudden change (Lengnick-Hall & Tammy, 2005), and to avoid and navigate risks (Somers, 2009). In our context, we have seen how COVID-19 has disrupted the supply chain, created a devastating effect because of the lockdown, and increased the risk of financial liquidity problems for businesses (The Economist, 2020b, 2020c). As a result, we selected four items to measure resilience, measuring the firm's ability to adapt to market volatility, overcome uncertainty, avoid/reduce negative impact, and deal with financial liquidity problems due to the COVID-19 pandemic.

Board involvement in crisis management is the third construct. It influences resilience and also serves as the mediator between board cognitive diversity and resilience. Four items are used to measure board involvement in crisis management. As presented earlier, this construct measures the extent to which the board is involved in developing crisis management capabilities (Bundy et al., 2017; Deloitte, 2019), clarifying crisis management responsibilities and roles (Bundy et al., 2017; Galbraith, 1974), achieving effective crisis communication through identifying a key spokesperson (Deloitte, 2019; Loop, 2017; Osler, 2016; Williams et al., 2017), and ensuring IT readiness to handle operational emergencies (Egelhoff & Sen, 1992; Shankar, 2020).

The construct of board expertise is the control variable. Board expertise measures the degree of directors' knowledge in their typical roles, such as compensation, nomination, succession, auditing, and strategic planning (Huse, 2018). Board knowledge and expertise contribute to overall organizational knowledge, vital for a firm to develop adaptability to changes, solve problems, and build resilience (Hamel & Valikangas, 2003). Board knowledge can also shape the way in which directors give advice and render service to the management, and ultimately the firm's performance during a crisis (McNulty, 2013; Merendino & Sarens, 2020). In summary, board expertise is an integral part of the firm's internal resources, influencing the board's response to a crisis (Bundy et al., 2017). We also controlled for firm revenue. A healthy revenue helps firms weather the storm

of a market shock (Markman & Venzin, 2014). Firm revenue of 2019 could thus influence resilience in the COVID-19 crisis.

The confirmatory factor analysis (CFA) from the SPSS AMOS is applied to evaluate the four constructs. The summary of the four constructs and the measurement model is presented in Table 2, with the construct reliability and validity measures presented in Table 3. The covariance table is provided in Appendix 2.

Table 2. Constructs and Model Fit

| Constructs | Loadings | |
|---|---|---|
| Board Cognitive Diversity | | |
| *Education backgrounds* | *0.721* | |
| *Vision for the firm* | *0.839* | |
| *Industry expertise* | *0.689* | |
| *Functional knowledge* | *0.746* | |
| *Personal values* | *0.825* | |
| Resilience | | |
| *Adapted well to market volatility* | *0.712* | |
| *Overcome uncertainty* | *0.768* | |
| *Avoided/reduced the negative impact* | *0.734* | |
| *Had financial liquidity problems* | *0.631* | |
| Board Involvement in Crisis Management Plan (BICMP) | | |
| *Responsibilities and roles* | *0.876* | |
| *Crisis management capabilities* | *0.837* | |
| *Chief spokesperson/management leader* | *0.748* | |
| *IT preparedness* | *0.759* | |
| Board Expertise | | |
| *Compensation* | *0.788* | |
| *Nomination* | *0.780* | |
| *Audit* | *0.668* | |
| *Succession planning* | *0.722* | |
| *Strategic planning* | *0.667* | |
| Measurement Model Fit Indices | Values | Threshold Values |
| *CMIN/DF* | *1.569* | *1- 3* |
| *CFI* | *0.970* | *>0.95* |
| *RMSEA* | *0.046* | *<0.06* |
| *PCLOSE* | *0.700* | *>0.05* |

In Table 2, the measurement model has indicated a good model fit. The index CMIN/df measures the minimum discrepancy, and a value between 1 and 3 shows an acceptable fit (Carmines & McIver, 1981). The comparative fitness index (CFI) is a relatively independent measure of sample size, and the fit is adequate when a value is larger than 0.95 (Hu & Bentler, 1998). Root Mean Square Error of Approximation (RMSEA) is a popular measure of model fit, and a value smaller

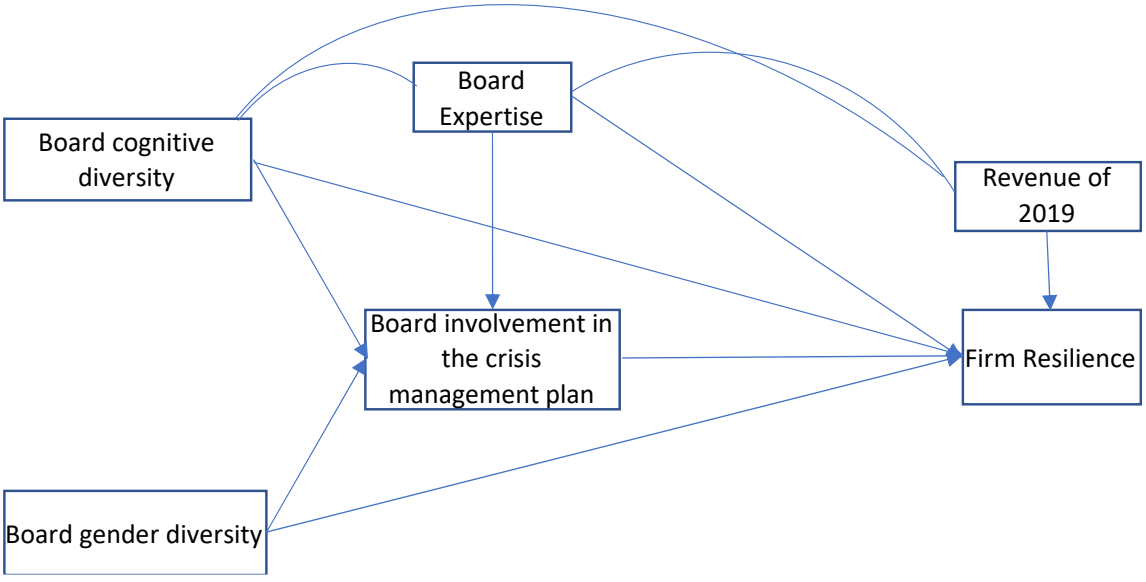
than 0.06 should suffice (Hu & Bentler, 1999). PCLOSE (p of Close Fit) often pairs together with RMSEA when RMSEA is smaller than 0.05 (which is the case in our study), and a value larger than 0.05 suggests a close fit (Hair, Black, Babin, & Anderson, 2010).

Table 3. Reliability and Validity

| | CR | AVE | MSV | MaxR(H) | | | | |
|---|---|---|---|---|---|---|---|---|
| BICMP | 0.888 | 0.665 | 0.417 | 0.896 | 0.815 | | | |
| Board Cognitive Diversity | 0.876 | 0.587 | 0.048 | 0.886 | 0.220 | 0.766 | | |
| Resilience | 0.805 | 0.508 | 0.321 | 0.811 | 0.567 | 0.164 | 0.713 | |
| Board Expertise | 0.848 | 0.528 | 0.417 | 0.855 | 0.646 | 0.160 | 0.533 | 0.727 |

Reliability and validity measures are presented in Table 3. The reliability of a construct measures the consistency of items. We use the Composite Reliability (CR) index, which takes into consideration errors of items, and a value above 0.7 suggests acceptable reliability (Hair et al., 2010). The CR values of the four constructs are all higher than 0.8. We have no reliability concerns. The validity of a construct measures the degree of the quality of the measurement. We use the Average Variance Extracted (AVE) to measure the convergent validity, and a value larger than 0.5 suggests that a construct is well measured by the indicators (Fornell & Larcker, 1981). All AVEs are higher than 0.5, and the significant factor loadings in Table 2 echo the same result. Four factors of the study show a good convergent validity. We have measured the discriminant validity, which examines how different constructs are from each other. Good discriminant validity requires that the Maximally Shared Variance (MSV) is smaller than the corresponding AVE, the Maximum Rho (MaxR(H)) is larger than MSV, and the square root of the AVE of the constructs is larger than the correlation displayed on the diagonal of the table (Fornell & Larcker, 1981). The four constructs satisfy these requirements (see Table 3), and they are distinctively different from each other. To conclude, we have obtained good measurements for the constructs.

Figure 2. SEM of the Research



Structure Model fit:
CCMIN=1.371 (1-3), CF = 0.996 (>0.95), RMSEA=0.037 (<0.06), PCLOSE=0.535 (>0.05)

**Analysis**

Structural Equation Modeling (SEM) is applied. We used SPSS AMOS version 25.0.0 to run the SEM model and check the model fit (see Figure 2). In the model, we regress board cognitive diversity and gender diversity on firm resilience directly and indirectly through the mediator of board involvement in the crisis management plan.

The model fit indices suggest we have a good model fit. In particular, the RMSEA is 0.037, indicating a good and close fit (Byrne, 2001). The R square for resilience and board involvement in the crisis management plan is 0.469 and 0.526, respectively, indicating we could reasonably draw statistical inferences from the model results (see Table 4).

Table 4. Direct, Indirect and Total Effect

| | Resilience R^2=0.469 | | | Board Involvement in Crisis Management Plan (BICMP) R^2=0.526 | | |
|---|---|---|---|---|---|---|
| | Direct effect | Indirect effect | Total effect | Direct effect | Indirect effect | Total effect |
| Board expertise | 0.308 P=0.009 | 0.274 P=0.001 | 0.582 P=0.008 | 0.695 P=0.004 | 0.000 - | 0.695 P=0.004 |
| Revenue 2019 | 0.097 P=0.043 | 0.000 - | 0.097 P=0.043 | 0.000 - | 0.000 - | 0.000 - |
| Board cognitive diversity | 0.017 P=0.640 | 0.045 P=0.011 | 0.062 P=0.168 | 0.114 P=0.021 | 0.000 - | 0.114 P=0.021 |
| Board gender diversity | -0.059 P=0.085 | -0.014 P=0.159 | -0.072 P=0.069 | -0.034 P=0.168 | 0.000 - | -0.034 P=0.168 |
| BICMP | 0.394 P=0.002 | 0.000 - | 0.394 P=0.002 | 0.000 - | 0.000 - | 0.000 - |
| N=271 | | | | | | |

The hypotheses aim to evaluate the direct and indirect effects. The direct effect concerns how board cognitive diversity and gender diversity influence resilience. The indirect effect concerns how board involvement in a crisis management plan mediates the above relationships. Therefore, it is necessary to evaluate the indirect, direct, and total effect in the SEM analysis (Siegfried & Thomas, 2011).

The direct effect describes a direct relationship without any mediation. We investigate 1) the effect of board diversities and the effect of board involvement in crisis management planning on resilience, and 2) the effect of board diversities on board involvement in a crisis management plan. Regarding regression on resilience, board gender diversity significantly and negatively influences resilience at -0.059 with p=0.085. The impact of board cognitive diversity, however, is insignificant with p=0.640. The effect of board involvement in crisis management is significant at 0.394 with p=0.002. Regarding regression on board involvement in the crisis management plan, board cognitive diversity significantly influences the mediator at 0.114 with p=0.021, while board gender diversity fails to produce a significant result.

The indirect impact describes the mediation effect. We only examine the indirect effect of board diversities on resilience through board involvement in a crisis management plan. The results show that board cognitive diversity has a significant and positive indirect effect on resilience at 0.045 with p=0.011, while board gender diversity fails to produce a significant result.

The total effect describes an overall impact from both the direct and indirect influences. We checked two total effects: the total effect of board diversity on resilience, and the other the total effect of board diversity on board involvement in a crisis management plan. The results show that the total effect of board gender diversity on resilience is significant at -0.072 with p=0.069. The total effect of board cognitive diversity is insignificant. The total effect of board gender diversity on board involvement in a crisis management plan is insignificant, and while board cognitive diversity has a significant and positive impact at 0.114 with p=0.021 Hypothesis 1.1 suggests a positive relationship between board cognitive diversity and resilience. The direct and total effect of board cognitive diversity on resilience is insignificant, rejecting the hypothesis. Hypothesis 1.2 describes a positive relationship between board gender diversity and resilience. This hypothesis fails to receive support, as the direct and total effects are both significantly negative.

Hypothesis 2.1 claims a positive relationship between board involvement in the crisis management plan and resilience. We have found support for this hypothesis, where the direct and total effect of board involvement in the crisis management plan on resilience are both significant at 0.394 with p=0.002.

Hypothesis 2.2 suggests a positive and indirect effect of board cognitive diversity on resilience through board involvement in the crisis management plan. When examining the mediation effect of board involvement in crisis management, board cognitive diversity's direct and total impact on resilience is insignificant. However, the indirect effect is significant at 0.045 with p=0.011. Albeit it is difficult to examine the mediation effect when there is a lack of direct and total effect (Baron & Kenny, 1986), such cases do exist (Rucker, Preacher, Tormala, & Petty, 2011). Participants may have difficulty generating thoughts about a concept, and are thus less confident and less favorable about it, leading to insignificant direct and total effects (Tormala, Falces, Brinol, & Petty, 2007). In our case, the participants may have difficulty perceiving board cognitive diversity with confidence in a crisis without knowing how cognitive diversity is utilized (Van Knippenberg et al., 2004). As a result, the direct and total effects become insignificant. However, a potential mediator could still exist (Rucker et al., 2011; Tormala et al., 2007), as exemplified by a significant indirect

relationship between board cognitive diversity and resilience via board involvement in a crisis management plan. Hypothesis 2.2 receives support.

Hypothesis 2.3 suggests a positive and indirect effect of board gender diversity on resilience through board involvement in the crisis management plan. The indirect effect is insignificant (p=0.159). Hypothesis 2.3 fails to receive support.

## DISCUSSION

Scholars and researchers have long noticed that boards of directors affect firm performance during a crisis (Duchek et al., 2020; Fernandes et al., 2017; Lorsch & Maclver, 1989; Luciano et al., 2020; McNulty, 2013). The influence is becoming ever more crucial when the pace, severity, and complexity of the modern crisis is seen to have intensified, so much so that most firms experience a crisis every four or five years (Kahn et al., 2013). However, what used to work in a normal situation, may not apply in crises when examining board behavior (Fernandes et al., 2017; Kapper & Love, 2004; Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998), such as the impact of board diversity. Although there is evidence indicating both board cognitive diversity and gender diversity can improve firm performance (Roberson, Holmes, & Perry, 2017), the relationship between diversity and resilience remains underexplored during a crisis (Duchek et al., 2020). This paper investigates the impact of board diversity on resilience during the initial phase of the COVID-19 when the speed of the pandemic caught businesses off guard, and many of them failed to cope with a sharp revenue decline in a short time and had to file for bankruptcy (The Economist, 2020b, 2020c, 2020d).

### Board Involvement in Crisis Management

According to information processing theory, it is fruitful to investigate potential mediators to shed light on how group diversity can be utilized (Simons, 1978; Van Knippenberg et al., 2004). Our study confirms the usefulness of the approach by identifying board involvement in crisis management as the mediator. Board involvement in the crisis management plan underscores the board's willingness to spend its effort on developing guidelines for actions to take control of a chaotic situation induced by a crisis. The plan can be strategic, providing a long-term solution (Preble, 1997). It can also serve as a short-term toolbox, enabling the search for an immediate response (Weick, 1988). The study result shows that the impact on resilience of board involvement in the crisis management plan is strong at 0.394, higher than the effect of board expertise at 0.308. The indirect effect of board expertise via board involvement in the crisis management plan is also significant at 0.274 (p=0.001) (see Table 4). The significant results suggest that the boards of directors utilize its members' knowledge and expertise through a process of developing a crisis management plan, building a deep level of information richness (Jackson et al., 1995), and ultimately creating a positive impact on resilience.

The importance of board involvement in a crisis management plan also fits the argument of sense-making (Weick, 1988), which may become more useful for organized collective decision-making under specific guidelines (Foss, 2020). The deeply ambiguous nature of crises, such as the initial phase of COVID-19, suggests a lack of precise understanding of what to do. A crisis management

plan is likely to reduce the confusion, guiding the collective decision-making effort to make a best guess for a way forward in an uncertain situation.

**Board Cognitive Diversity**

Board cognitive diversity has generated an unexpected result in this study. We have observed a significant and indirect relationship between board cognitive diversity and resilience, but we fail to confirm a direct relationship between them. Such a combination is rare but possible (Rucker et al., 2011; Tormala et al., 2007). It suggests that respondents may have difficulties perceiving board cognitive diversity without knowing how cognitive diversities are utilized (e.g., Rucker et al., 2011; Tormala et al., 2007). The explanation renders support to the information processing claim that sharing and processing diverse and unique information is crucial when examining cognitive diversity's impact (Simons, 1978; Van Knippenberg et al., 2004), and perhaps more so in a crisis.

**Board Gender Diversity**

The result of an adverse effect of board gender diversity on resilience has three implications. First, the negative effect of -0.059 suggests that a potential benefit due to information variety of gender diversity has not occurred. The explanation of informational advantages has not received support for gender differences. The negative result is consistent with the prediction of social categorization theory (Tajfe, 1981; Van Knippenberg et al., 2004). According to the theory, gender diversity is prone to promote in-group and out-group associations between male and female directors, increasing group conflicts and reducing group cohesion (Tajfe, 1981; Van Knippenberg et al., 2004). It is possible in our case, gender diversity has impeded the sharing and disseminating of diverse information, and consequently, we have observed a negative relationship between gender diversity and resilience. Social categorization's negative effect could be present when evaluating the direct effect of gender diversity on board involvement in a crisis management plan. The effect is -0.034 but insignificant.

Second, the indirect effect of gender diversity on resilience is not significant with p=0.159; board involvement in the crisis management plan does not mediate board gender diversity on resilience. There are two inferences. First, it is necessary to differentiate the dimensions of diversities, as they may exert different impacts (Milliken & Martins, 1996; Nkomo et al., 2019; Williams & O'Reilly, 1998). Second, the mediating mechanism, which is effective for board cognitive diversity, fails to work for board gender diversity. Tapping into informational benefits due to gender may require a different mechanism; perhaps, board leadership may serve as an effective mediator (Kakabadse et al., 2015).

Third, the discussion of gender differences in a board is likely to continue. We may witness an intensified working relationship between male and female directors in a crisis when there is less time, and perhaps, less patience for the in-group members to hear out the out-group members. Although gender diversity can create positive effects (Kakabadse et al., 2015; Poletti-Hughes & Briano-Turrent, 2019), our study suggests gender diversity in the pandemic may produce more stress and conflicts.

## Future Research

This paper has focused on board involvement in the crisis management plan as a mediator. Future research could investigate other mechanisms. For example, some have used the degree of cognitive diversity as a moderator of information integration (Dahlin et al., 2005). They found that after the degree of diversity reaches a saturation point, it becomes difficult for members to absorb the additional unique information: the marginal benefits of cognitive diversity decline. The degree of cognitive diversity gains interest in another study of debiasing judgment in an executive team (Meissner & Wulf, 2017). However, the paper suggests a high degree of cognitive diversity is more powerful than a low degree of cognitive diversity in reducing decision-making biases. In a crisis, whether the degree of diversity matters in resilience, we know little about yet.

Leadership is another critical moderator, which improves group diversity effectiveness (Wang, Kim, & Lee, 2016). Future studies may combine leadership and gender diversity in the context of a crisis and explore how leadership could moderate the negative impact of gender diversity on resilience.

It is important to point out a special feature of a crisis. Besides being highly salient, unexpected, and potentially disruptive, a crisis is a part of a larger process rather than a discrete event (Bundy et al., 2017; Williams et al., 2017). Therefore, the board's involvement in the crisis management plan should reflect a continuous effort, such that the plan can change to fit an evolving environment (Egelhoff & Sen, 1992; Osler, 2016; Preble, 1997). While focusing board diversity on knowledge and skills is a critical part of building a strong process (McNulty et al., 2013), future studies could examine change in a crisis management plan and how board diversity influences that change.

The current paper has measured resilience using the organizational response to COVID-19. We see two potential areas of further study relating to resilience measurement in a crisis. First, future studies could approach resilience by measuring organizational reliability and employee strengths (Linnenluecke, 2017). In particular, it could be interesting to investigate the impact of board diversity on employee strengths during COVID-19. Second, while we have chosen a long-term perspective in our to approach resilience; however, a firm's response to resilience isn't the same for all, and decision-makers' subjective values can influence the choice of actions (Jones, 2019). The response to the pandemic could signal a short-term orientation, such as laying off employees and closing stores (Campello, Giambona, Graham, & Harvey, 2011), which may create an immediate result but at the cost of weakened employee strengths (Linnenluecke, 2017). Future studies could explore board involvement in both long- and short-term responses to a crisis.

Finally, this study has not examined the impact of a crisis management plan for small businesses with a board size below four members. Researchers have pointed out the acute situation smaller firms endure during a crisis and the benefits a crisis management plan may bring (Berbane, 2010). However, small businesses' approaches to resilience may vary substantially from more resourceful firms (Harries, McEwen, & Wragg, 2018). Future research, therefore, could explore conditions under which small businesses implement the crisis management plan to improve resilience.

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## Appendix 1 - Survey items on the four constructs

1. Please rate the degree of directors' expertise using a 7-point Likert scale between extremely low to extremely high.
   a. Compensation
   b. Nomination
   c. Audit
   d. Succession planning
   e. Strategic planning
2. Using a 7-point Likert scale between very similar to very different, circle how different are the directors in their
   a. Education backgrounds
   b. Visions for the firm
   c. Industry expertise
   d. Functional knowledge
   e. Personal values
3. Using a 7-point Likert scale between never to very frequently, circle before COVID-19, how often has the board
   a. inquired about responsibilities and roles in case of a crisis?
   b. asked about the crisis management capabilities of the executive team?
   c. asked who the chief spokesperson/management leader is during the crisis period?
   d. inquired about the IT preparedness in case of a crisis?
4. Using a 7-point Likert scale between strongly disagree to strongly agree, regarding the business continuity during COVID-19, the firm has
   a. adapted well to the market volatility
   b. overcome the uncertainty
   c. avoided/reduced the negative impact
   d. had financial liquidity problems (reverse coding)

## Appendix 2 – Covariance Matrix

| | | | | | | Resilience | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Div1 | Div2 | Div3 | Div4 | Div5 | 1 | 2 | 3 | 4 |
| Diversity_Education | 2.547 | 1.425 | 1.272 | 1.415 | 1.562 | .132 | .230 | .316 | .326 |
| Diversity_Vision | 1.425 | 2.242 | 1.391 | 1.512 | 1.721 | .110 | .152 | .185 | .306 |
| Diversity_Expertise | 1.272 | 1.391 | 2.503 | 1.859 | 1.451 | .090 | .146 | .203 | .401 |
| Diversity_Functions | 1.415 | 1.512 | 1.859 | 2.656 | 1.670 | -.025 | .107 | .293 | .533 |
| Diversity_Values | 1.562 | 1.721 | 1.451 | 1.670 | 2.728 | .096 | .136 | .295 | .429 |
| Resilience_Volatility | .132 | .110 | .090 | -.025 | .096 | 1.632 | 1.061 | .848 | .834 |
| Resilience_Uncertainty | .230 | .152 | .146 | .107 | .136 | 1.061 | 1.926 | 1.059 | .872 |
| Resilience_Impact | .316 | .185 | .203 | .293 | .295 | .848 | 1.059 | 1.846 | 1.022 |
| Resilience_Liquidity | .326 | .306 | .401 | .533 | .429 | .834 | .872 | 1.022 | 2.182 |
| BICMP_Responsibilities | .377 | .403 | .232 | .313 | .295 | .448 | .567 | .662 | .624 |
| BICMP_Capabilities | .388 | .270 | .160 | .125 | .200 | .494 | .598 | .499 | .385 |
| BICMP_Spokesperson | .397 | .298 | .268 | .268 | .268 | .668 | .842 | .678 | .630 |
| BICMP_IT | .332 | .268 | .094 | .245 | .296 | .631 | .732 | .699 | .546 |
| Expertise_Compensation | .402 | .179 | .014 | .194 | .173 | .425 | .483 | .508 | .573 |
| Expertise_Nomination | .301 | .134 | .097 | .180 | .153 | .339 | .479 | .410 | .628 |
| Expertise_Audit | .136 | .145 | .058 | .085 | .085 | .365 | .498 | .494 | .603 |
| Expertise_Succession | .296 | .121 | .293 | .215 | .133 | .319 | .473 | .507 | .686 |
| Expertise_Strategy | .400 | .160 | .187 | .277 | .109 | .321 | .439 | .361 | .578 |

| | BICMP | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | Exp1 | Exp2 | Exp3 | Exp4 | Exp5 |
| Diversity_Education | .377 | .388 | .397 | .332 | .402 | .301 | .136 | .296 | .400 |
| Diversity_Vision | .403 | .270 | .298 | .268 | .179 | .134 | .145 | .121 | .160 |
| Diversity_Expertise | .232 | .160 | .268 | .094 | .014 | .097 | .058 | .293 | .187 |
| Diversity_Functions | .313 | .125 | .268 | .245 | .194 | .180 | .085 | .215 | .277 |
| Diversity_Values | .295 | .200 | .268 | .296 | .173 | .153 | .085 | .133 | .109 |
| Resilience_Volatility | .448 | .494 | .668 | .631 | .425 | .339 | .365 | .319 | .321 |
| Resilience_Uncertainty | .567 | .598 | .842 | .732 | .483 | .479 | .498 | .473 | .439 |
| Resilience_Impact | .662 | .499 | .678 | .699 | .508 | .410 | .494 | .507 | .361 |
| Resilience_Liquidity | .624 | .385 | .630 | .546 | .573 | .628 | .603 | .686 | .578 |
| BICMP_Responsibilities | 1.598 | 1.168 | 1.142 | 1.152 | .735 | .642 | .595 | .669 | .531 |
| BICMP_Capabilities | 1.168 | 1.488 | 1.146 | .981 | .589 | .573 | .491 | .528 | .479 |
| BICMP_Spokesperson | 1.142 | 1.146 | 1.906 | 1.169 | .590 | .595 | .569 | .571 | .502 |
| BICMP_IT | 1.152 | .981 | 1.169 | 1.867 | .759 | .742 | .586 | .567 | .515 |
| Expertise_Compensation | .735 | .589 | .590 | .759 | 1.339 | .860 | .691 | .821 | .714 |
| Expertise_Nomination | .642 | .573 | .595 | .742 | .860 | 1.417 | .826 | .788 | .714 |
| Expertise_Audit | .595 | .491 | .569 | .586 | .691 | .826 | 1.589 | .791 | .680 |
| Expertise_Succession | .669 | .528 | .571 | .567 | .821 | .788 | .791 | 1.505 | .884 |
| Expertise_Strategy | .531 | .479 | .502 | .515 | .714 | .714 | .680 | .884 | 1.358 |

# QRBD

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